Before the
Federal Communications Commission
Washington, D.C. 20554

GEN Docket No. 87-389

In the Matter of

Revision of Part 15 of the Rules
regarding the operation of radio
frequency devices without an
individual license - American
Radio Relay League petition
for reconsideration

MEMORANDUM OPINION AND ORDER

Adopted: November 26, 1990; Released: December 7, 1990

By the Commission:

1. By this action the Commission denies a Petition for Reconsideration filed on May 25, 1989, by the American Radio Relay League, Incorporated (the League).[1] The League requests that the Commission reconsider and reverse certain portions of the *First Report and Order* in this proceeding.[2] Therein, the Commission revised Part 15 of the regulations governing the non-licensed operation of radio frequency (RF) devices. [3] The League is concerned that such devices have the potential to both cause interference to, and receive interference from, stations operating in the Amateur Radio Service. The Commission finds that the League presents no new information in its petition that would justify a further change in the Part 15 rules.[4]

BACKGROUND

2. In the *First Report and Order*, the Commission adopted technical standards and other policies intended to balance the competing goals of minimizing the potential for Part 15 devices to cause interference to authorized services and providing reasonable opportunity for operation of a broad range of non-licensed RF equipment that would have significant benefits for the public. The Commission attempted to eliminate all unnecessary and overly restrictive regulations in order to provide greater flexibility in the operation of non-licensed Part 15 equipment. In some instances, however, the technical standards were actually made more restrictive in order to protect the authorized services, such as the Amateur Radio Service, from potential harmful interference.

3. In order to minimize the probability that harmful interference might be caused to the authorized services, the Commission, *inter alia*, subjects Part 15 devices to limits on emissions radiated through the air or conducted through the power line.[5] In the *First Report and Order*, the Commission adopted new radiated and conducted limits for Part 15 devices. These new limits were based on the Commission's experience as to emission levels that will not create undue risk of interference to authorized radio services; the former Part 15 Class B (residential use) computing device limits; and, the recommendations of the U.S. Department of Commerce, National Telecommunications and Information Administration (NTIA).[6] To provide additional protection to sensitive authorized services that involve communications related to safety-of-life situations or that depend on reception of very low level signals, the Commission established several restricted frequency bands within which Part 15 intentional radiators may not operate.[7] Only spurious emissions are permitted in the restricted bands.[8] The Commission also authorized the operation of Part 15 devices at higher emission levels on frequency bands allocated to industrial, scientific, and medical (ISM) devices.[9] Several of these bands, *e.g.*, those above 900 MHz, are also allocated for amateur use.

4. In adopting the new Part 15 rules, the Commission considered several requests presented by the League including special protection for the amateur services, more restrictive emission limits for Part 15 devices, and requirements for manufacturers of Part 15 devices to provide interference resolution materials to consumers. The Commission found that the newly established emission limits and other general provisions of the Part 15 rules would be adequate to protect the amateur radio and other authorized services from interference by Part 15 devices and declined to adopt the measures proposed by the League.

SUMMARY OF PETITION AND COMMENTS

5. In its petition, the League contends that the Commission erred in a number of aspects of its decision in the *First Report and Order*. The League's basic position is that the Commission did not correctly evaluate the impact of the new Part 15 rules on both the amateur radio service and consumers of home electronic devices. It states that the Commission did not adequately consider the League's engineering data and disregarded the many comments by amateur operators discussing the interference potential of Part 15 devices. The League also presents a new study based on an "advanced" engineering model. The conclusion of this study is that the signal levels permitted under both the former and new Part 15 rules are, on amateur frequencies, in excess of those which can cause serious interference in amateur receivers and that the interference area of a single Part 15 emitter is extremely large, ranging from 750 to 1,750 meters, depending on the frequency of the emission. The League further claims that the Commission did not consider its own records of interference complaints, which the League states indicate a far more serious level of interference than assumed in the *First Report and Order*.

6. The League argues that as a result of these errors, the Commission has adopted field strength limits for both intentional and unintentional radiators that are too high to provide authorized services adequate protection from interference. It also asserts that the new bands available for operation of Part 15 devices at higher power levels that coincide with amateur bands invite serious interference problems for large numbers of both consumers and amateurs. To remedy this situation, the League requests that the Commission limit the emissions of Part 15 intentional and unintentional radiators on amateur frequencies to the levels specified under the former rules.

7. The League again asks the Commission to prohibit the operation of Part 15 devices (intentional radiators) on amateur frequencies. It contends that the amateur service meets the criteria indicated in the *First Report and Order*

as necessary for restricted band status in that the amateurs provide safety-of-life communications and make use of low received signal levels.

8. The League asserts that the Commission's refusal to require even minimal education and protection material in the packaging of home electronic equipment leaves the non-technical consumer without a means for resolving interference problems. It requests that the Commission require manufacturers of interference susceptible Part 15 equipment to incorporate interference resolution information in the owner's or user's manual of that equipment, including a company address that can provide assistance to the non-technical consumer.

9. The Computer and Business Equipment Manufacturers Association (CBEMA), the Consumer Electronics Group of the Electronic Industries Association (EIA/CEG), General Motors Research Corporation (GM), and Wireless Technology, Incorporated (Wireless) filed oppositions to the League's Petition for Reconsideration. These parties support the basic policy approach embodied in the new rules and oppose the modifications requested by the League.

10. The commenting parties support the general emission limits for Part 15 devices adopted by the Commission. The EIA/CEG states that the new rules provide a reasonable balance of the need to protect authorized services from harmful interference with the need to allow for the consumer benefits made possible by electronic equipment authorized under Part 15. It agrees with the Commission's determination in the *First Report and Order* that many of the changes in Part 15 either do not affect amateur operations or actually reduce the potential for Part 15 devices to cause interference to amateurs.

11. CBEMA states that the League's arguments that the continuation or adoption of the Class B digital device limits without technical justification ignore the substantial record that was developed over the last 15 years, during which those limits were adopted and applied. It observes that the adoption of the Class B limits in Docket No. 20780 was based in large measure on a technical study submitted by CBEMA itself. It states that this study fully documented, both theoretically and empirically, the approach used to calculate the emission limits. CBEMA further states that, contrary to the League's position, the absence of interference complaints is evidence validating the standard. CBEMA submits that the Commission's experience with the interference assessment method, coupled with nearly a decade of experience with the Class B standards, establishes a fully reasoned basis for the decision to expand the use of those limits.

12. GM states that the League's technical analysis overstates the amount of additional interference that will result from the new rules. It submits that the League implicitly seeks to protect against the worst case, so that there would be no possibility that a Part 15 device would ever degrade any amateur service. It further states that while there are no doubt serious problems with the FCC's compilation of interference complaints, these records are the most reliable indication available of the real world as opposed to worst case conditions. GM submits that if the interference situation with respect to Class B computing devices were as bad as the League claims, the public would long ago have made it clear that this was unacceptable.

13. GM and Wireless state that while the League is correct that interference from amateur, ISM and even government operations is possible to Part 15 devices operating in the ISM bands above 900 MHz, there are many applications in these bands where such interference will not be a problem. They state that to prevent all uses because some uses may be subject to interference is overregulation of the worst sort. GM states that the League's entire discussion of this fails to acknowledge that susceptibility to interference is under the control of the equipment designer and is not a preordained fact.

14. The EIA/CEG also argues that amateur frequencies should not be included in the restricted bands. It submits that a radio service used primarily for personal communications, "self-training" and advancement of the radio art should not merit equal stature with services involving safety-of-life or services that are required by the nature of their operation to use signals at low levels. EIA/CEG also argues that the League has not explained why the amateur service deserves more protection than other services such as broadcasting and public safety land mobile radio.

15. The EIA/CEG contends that a requirement forcing manufacturers to provide interference resolution information, including a manufacturer's contact, for Part 15 equipment is unnecessary. It states that such a requirement would present manufacturers with additional costs and burdens. EIA/CEG states that many manufacturers and retailers already provide information and assistance to consumers, including "800" numbers and that market forces will continue to induce them to provide assistance to the consumer.

16. The League filed comments in reply to the above oppositions. In reply to GM's assertion that it would be unjustified to prevent all Part 15 users from operating on the shared ISM and amateur frequencies just because some users may be subject to interference, the League now states that it opposes the operation on these frequencies of new Part 15 devices in residential areas only. The League's reply comments also contain a new "best case" engineering study in which the effects of interference from Part 15 devices to the amateur radio service have been minimized. The League claims that, even assuming the greatest possible attenuation, the interference contours are still objectionably large.

DISCUSSION

17. We continue to believe that the rules set forth in the *First Report and Order* afford adequate and appropriate interference protection to the amateur service from the operation of Part 15 devices. We find that the additional restrictions and requirements the League seeks are unnecessary. We have carefully examined the League's submissions, which are essentially the same as those presented in its comments earlier in this proceeding, and conclude that our assessments and decisions in the *First Report and Order* are correct.

18. We maintain our finding that the general radiation limits adopted in the *First Report and Order* provide adequate protection to the amateur service from interference caused by Part 15 devices. Many of the Part 15 changes either do not affect amateur operations or would actually reduce the potential for Part 15 devices to cause interference to amateurs. The areas of the new Part 15 rules which the League believes allow higher emission levels and/or encourage a greater number of Part 15 devices in

the amateur bands are the general radiated emission limits for intentional radiators operating between 1.705 and 960 MHz and. the provisions for the new general bands,[10] as provided in 47 CFR Section 15.249, in which emission levels higher than the general limits are permitted.

19. The general radiated emission limits in the new rules provide that the maximum allowable field strength in the 1.705-30 MHz band is 30 uV/m at 30 meters, based on measurements employing a CISPR quasi-peak detector.[11] Under the former regulations, the radiated emission limit for the 1.705-10 MHz band varied depending on the bandwidth of the emission, ranging from an average field strength of 15 uV/m at 30 meters for certain narrowband signals to 100 uV/m at 30 meters for wideband signals.[12] The new general limit is based on the lowest permitted value of the former limit with an increase, from 15 uV/m to 30 uV/m only, to compensate for the effect of the change in measurement procedures.[13] Thus, for the 1.705-10 MHz band the new general limit is 6 dB less stringent for narrowband operations only. For wideband operations, the new limit for the 1.705-10 MHz band is more stringent. Over the short distances involved, the propagation characteristics for the 1.705-10 MHz and the 10-30 MHz band are similar. In addition, in terms of required interference protection, the types of authorized radio services operating within the 10-30 MHz band are also similar to those operating in the 1.705-10 MHz band. The limit established for the 1.705-10 MHz band was therefore applied to the 10-30 MHz band as well.

20. Although we appreciate the League's fears of increased interference in the 1.705-30 MHz band, they are unfounded. We are unaware of any interference to amateur operations from Part 15 devices operating in the 1.705-10 MHz band under the higher limit of 100 uV/m.[14] The large numbers of licensed users effectively preclude the general operation of Part 15 devices at the lower general limit in the 1.705-30 MHz band. Only those devices used in relatively shielded areas can be used at the Part 15 general emission limits. It is not likely that this situation will change.

21. The general limits adopted for intentional radiators operating in the frequency band 30 to 960 MHz are identical to the long established limits which apply to Class B computing device emissions on the the same frequencies. The derivation of the Class B computing device limits, which have been in effect for over ten years, is contained in the *First Report and Order* in Docket No. 20780.[15] As noted by CBEMA, these limits are based upon a comprehensive technical analysis including required interference protection for amateur frequency bands. These limits have proven adequate over the last ten years of the Commission's experience in protecting the authorized services from harmful interference by Class B computing devices. As observed by CBEMA, our previous successful experience with these limits provides sufficient basis for their use as general emission limits on frequencies between 30 and 960 MHz.

22. With respect to the new general bands above 900 MHz, we note that thousands of Part 15 field disturbance sensors have been operating on frequencies allocated to the amateur services at significantly higher emission levels than permitted for general operations under the new rules.[16] These existing devices do not appear to be causing interference problems for the amateur service.

23. As far as interference by amateur stations to the new Part 15 devices operating in these frequency bands, we continue to believe, with the support of GM and Wireless, that there are many applications in these bands where interference will not be a problem. As stated by GM, susceptibility to interference is under the control of the equipment designer and is not a preordained fact. We do not believe that manufacturers will design products that are unable to cope with the radio environment in the frequency bands selected for operation. Negative publicity generated by consumer magazines and other sources will force manufacturers of poorly designed products to either improve their products or leave the market.

24. The Commission did consider the League's original interference study in adopting the new Part 15 emission limits. Neither the League's original study, its new engineering study contained in its petition for reconsideration, nor the study submitted by the League in its reply comments persuade us that the present Part 15 emission limits are insufficient to protect the amateur radio service from harmful interference. We find that the League's analyses are based on inappropriate or questionable assumptions that tend to overestimate the likelihood of interference. For example, the study in the petition is based on propagation conditions that are inappropriate for the suburban environments where the League alleges interference will occur.[17] In the study submitted in its reply comments, the League uses a different propagation model that takes into account the effect of buildings and foliage conditions more typical of the suburban environment. We observe that this change reduces the predicted interference contour from the Part 15 device by a factor of more than ten (from 640 meters to 50 meters for the frequency band 216 to 960 MHz). While the League claims this is a best case scenario, we believe it is merely more realistic of actual conditions. Moreover, the League's analysis assumes that the maximum permitted signal from the Part 15 device will be received by the amateur receiver. The conditions necessary for this to occur in practice will be rare. For example, a Part 15 device would have to be configured so that it is producing the maximum permitted signal, coincident in frequency with and oriented in the direction of the amateur receiver in order to interfere with reception. This is not likely to occur very often. We therefore continue to believe that the emission limits as adopted in the *First Report and Order* are adequate to guard against significant degradation of the amateur service by Part 15 devices.

25. The Commission also considered the numerous comments from individual amateur operators in adopting the new Part 15 emission limits. These comments generally identified three sources of interference: TV receivers, incidental radiators,[18] and computers. To the extent that TV receivers have caused any difficulties in the past, it should be noted that emission limits for TV and other receivers have been tightened. Incidental radiators have not been the subject of our technical standards, nor were such standards proposed in this proceeding. The number of references to computers were so few that we are led to believe such incidences of interference were caused by non-compliant or co-located computing devices. Our own records do not indicate any serious interference problems caused by equipment operating in compliance with the Class B emission limits.

26. We do not agree with the League's position that amateur frequencies should be included in the restricted bands. The Commission established the restricted bands to provide an extra measure of protection for services that primarily involve communications related to safety-of-life situations or that depend on reception of very low level signals. For example, safety-of-life frequencies include maritime, aeronautical, and mobile distress and safety channels, certain bands used to warn pilots when dangerous wind shear conditions exist around airports, and aeronautical radionavigation bands. Low level signal bands include radio astronomy frequencies and satellite space-to-earth channels. The presence of interfering signals on channels routinely used for safety-of-life communications could have serious consequences for individuals or the public. Similarly, even low level background noise on bands used for services whose basic functions rely on very low level signal levels could disrupt the operation of the affected services.

27. While we believe it is important and necessary to provide protection for the amateur radio service against interference by Part 15 devices, the same as we do for other authorized services, we do not find that the amateur service needs the additional protection afforded to the users of services indicated above. While we certainly recognize the valuable assistance amateur radio operators sometimes render in emergency situations, such activity is not the sole or primary function of the amateur service. Rather, as EIA/CEG observes, the amateur service is used primarily for personal communications, self-training and advancement of the radio art. We also would expect that if an amateur were experiencing interference from a nearby Part 15 device, he/she could take action to resolve that interference before a situation involving the need for emergency communications arose.

28. In addition, while amateurs often engage in long distance communications that rely on low level signals,[19] they also engage in many other types of operations that can tolerate considerable levels of background noise. Moreover, amateur operations typically involve recreational and hobbyist activities that can, if necessary, be repeated. Finally, we observe that the amateur service is afforded only a secondary or lesser allocation on many of the bands for which it requests restricted status.[20] It would make little sense to restrict Part 15 operations in these bands to protect amateur operations when the primary services on these bands have priority over the amateur service and do not themselves warrant restricted band status. Similarly, as noted by EIA/CEG, we have not found it necessary to expand the restricted bands to other important services such as broadcasting and public safety land mobile services, which include police, fire, and rescue operations. Accordingly, we are not including the amateur frequencies in the Part 15 restricted bands.

29. Finally, we are rejecting the League's request that manufacturers be required to provide interference resolution information in the Part 15 owner's or user's manual. The present FCC rules already require that Part 15 devices (with the exception of licensed radio service receivers and stand-alone cable input selector switches which have alternative labelling requirements) be labelled with a statement that states "this device must accept any interference received, including interference that may cause undesired operation."[21] We continue to believe that it would be unnecessarily burdensome for manufacturers to be required to provide interference resolution information for devices that are not protected from interference.

30. Accordingly, pursuant to the authority contained in Section 4(i) and 303 of the Communications Act of 1934, as amended, and Section 1.106 of the Commission's rules, IT IS ORDERED that the Petition for Reconsideration filed by the American Radio Relay League, Incorporated IS DISMISSED.

FEDERAL COMMUNICATIONS COMMISSION

Donna R. Searcy
Secretary

FOOTNOTES

[1] In addition to the subject Petition for Reconsideration, the League filed a Motion for Stay in this proceeding on May 25, 1989, which was subsequently denied by the Commission. *See Order Denying Petitions for Stay* in GEN Docket No. 87-389, 4 FCC Rcd 7869 (1989). The Court of Appeals for the District of Columbia Circuit similarly denied an Emergency Motion for Stay of Agency Action Pending Review filed by the League on June 20, 1989. *See American Radio Relay League, Inc. v. FCC and USA*, No. 89-1393, (D.C. Cir., June 21, 1989).

[2] *See First Report and Order*, GEN Docket No. 87-389, 4 FCC Rcd 3493 (1989).

[3] Devices which emit radio frequency energy are termed radio frequency (RF) devices. Radio frequency energy is defined as electromagnetic energy at any frequency in the radio spectrum between 9 kHz and 3,000,000 MHz. *See* 47 CFR 15.3(u).

[4] Several other petitions for reconsideration of the *First Report and Order* in this proceeding have also been filed. These petitions are being considered separately in other Commission actions.

[5] The energy conducted back onto the public utility (AC) power line can radiate from the power line. Interference from this type of emission usually occurs in the spectrum below 30 MHz. The Commission's rules specify limits on the amount of RF voltage conducted back onto the public utility (AC) power line in order to protect authorized services such as AM broadcasting and amateur radio.

[6] *See First Report and Order*, *supra*, at para. 20.

[7] An intentional radiator is a device that intentionally generates and emits RF energy by radiation or induction. An unintentional radiator is a device that intentionally generates RF energy for use within the device, or that sends RF signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction. *See* 47 CFR Section 15.3(o) and (z).

[8] A spurious emission is an unintentional emission that occurs on a frequency or frequencies outside of the intended operating frequency band. *See id.* at paras. 61-74 and 47 CFR Section 15.205.

[9] *See id.* at paras. 55-60 and 47 CFR Sections 15.225, 15.227, 15.229 and 15.249.

[10] These new bands are 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.

[11] *See* 47 CFR Section 15.209.

[12] Under the former rules, narrowband signals were those with a bandwidth less than +/- 5% of the center frequency. Wideband signals were those with bandwidth at least +/- 5% of the center frequency. *See* CFR Section 15.114 of the regulations in place prior to June 23, 1989.

[13] Because of the change in measurement technique from average to quasi-peak, this new limit is not substantially higher than the former limit since the quasi-peak readings are typically several dB higher than average readings for most modulations.

[14] Since 1986, Part 15 devices have been allowed to operate within the 1.705-10 MHz band with a maximum radiated field strength of 100 uV/m at 30 meters. *See Report and Order*, GEN Docket No. 85-129, 51 FR 4366 (1986).

[15] *See First Report and Order* in Docket No. 20780, 44 FR 59530 (1979).

[16] A field disturbance sensor is a device that establishes a radio frequency field in its vicinity and detects changes in that field resulting from the movement of persons or objects within its range. *See* 47 CFR Section 15.3(l).

[17] The League's study uses measured attenuation factors from a paper entitled "HF and VHF Radio Wave Attenuation Through Jungle and Woods," by Seymour Krevsky, IEEE Transactions on Antennas and Propagation, July 1963.

[18] An incidental radiator is a device that generates radio frequency energy during the course of its operation although the device is not intentionally designed to generate or emit radio frequency energy. Examples of incidental radiators are dc motors, mechanical light switches, etc. *See* 47 CFR Section 15.3(n).

[19] For example, a common amateur activity is to try to contact as many other distant amateur stations as possible. This practice is commonly known as "DX-ing."

[20] For example, within the 902-928 MHz frequency band the Amateur Radio Service is secondary to all other allocated operations. Stations in the amateur service must tolerate any interference received from the operation of ISM, Automatic Vehicle Monitoring systems and Government stations authorized within this band. Amateur stations operating within the 2400-2450 MHz, 5725-5875 MHz, and 24.0-24.25 GHz frequency bands must also accept any harmful interference caused by ISM equipment and U.S. Government stations operating in these bands. *See* 47 CFR Section 2.106.

[21] *See* 47 CFR Section 15.19.